COMBATXXI: Usage and Analysis at TACOM

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TACOM COST & SYSTEMS ANALYSIS

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  - ▪ **Our Customers**

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  - ▪ **Transition from CASTFOREM to COMBATXXI**

- ➤ **COMBATXXI Inputs and Outputs**

- ➤ **Performing Studies at TACOM**

- ➤ **TACOM Analysis Using COMBATXXI**

- ➤ **Future of COMBATXXI at TACOM**

Who We Are

- ➢ TACOM Life Cycle Management Command (LCMC)
- ➢ Cost & Systems Analysis Office
- ➢ Capability developed in 1991
- ➢ Ten full time analysts
- ➢ Dedicated secure facilities

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Our Equipment

Operational Effectiveness
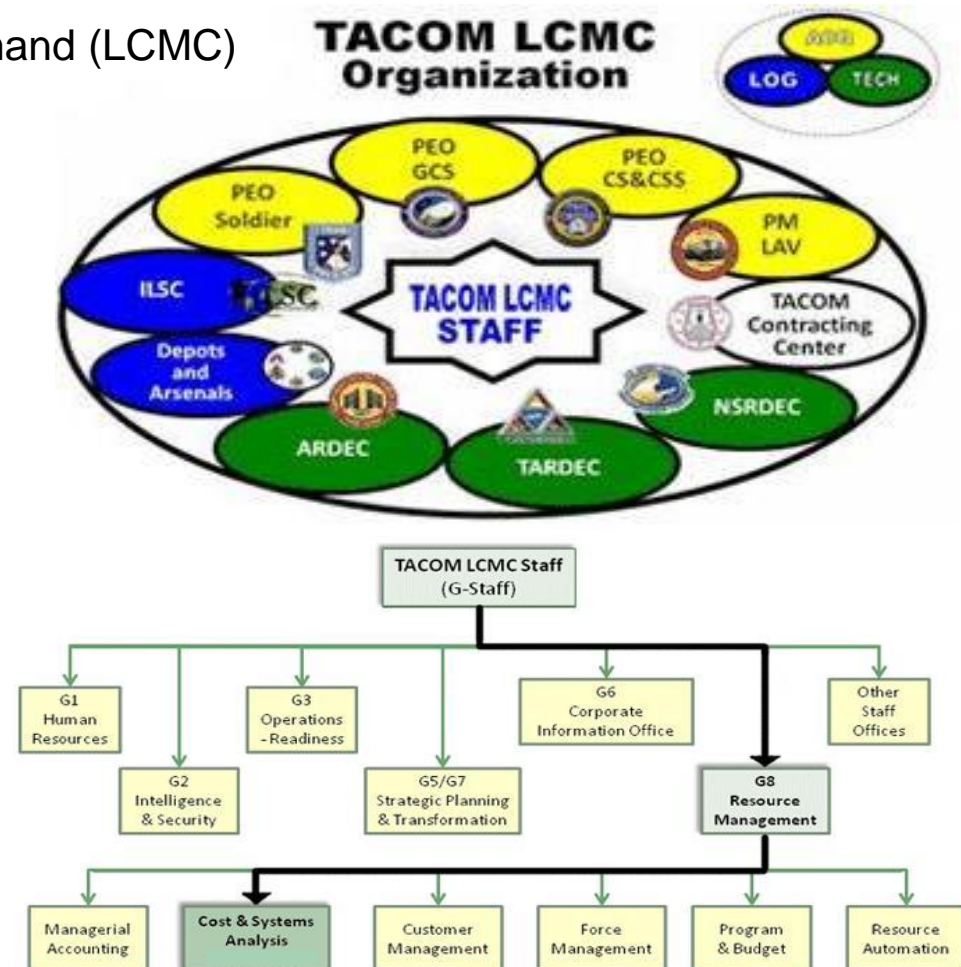
COMBATXXI Computing Power

➢ **C&SA Capabilities**
- 7 - 64 bit Linux servers - 56 addressable processors (COMBATXXI)
- 14 TB storage (local disk and NAS)
- Additional 20TB storage on order

➢ **TARDEC Capabilities**
- 256 - 64 bit blade servers - 512 addressable processors (COMBATXXI)
- 168 TB storage (NAS)
- 4 TB addressable memory (RAM)
- 1.3 PB (1300 TB) tape library

> Working the technical and accreditation issues to connect the two networks.

Our Customers

TACOM COST & SYSTEMS ANALYSIS

Operational Effectiveness

- ➢ PEO Ground Combat Systems (GCS)
  - ▪ PM Heavy Brigade Combat Team (HBCT)
    - ▪ Abrams
    - ▪ Bradley
    - ▪ Fire Support Platforms
  - ▪ PM Stryker
- ➢ MRAP – Mine Resistant Ambush Protected
- ➢ JLTV – Joint Light Tactical Vehicle
- ➢ TARDEC - Tank-Automotive Research, Development and Engineering Center

Model Overview

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Operational Effectiveness

➢ Combined Arms Analysis Tool for the 21st Century (COMBATXXI) - Developed jointly by TRAC- White Sands Missle Range (WSMR) and Marine Corps Combat Development Command (MCCDC)

➢ Successor to CASTFOREM

➢ Utilized to measure the operational effectiveness of weapon systems in a simulated combat scenario.

➢ Types of Studies:
- Trade Studies (Armor #1 vs. Armor #2)
- Parametric (Knee-in-Curve) Analysis (Signature Management)
- CDD Requirements Validation
- Optimization Analysis (Suites of Technologies)

Model Description:

- Force on Force Brigade and Below Combat Model

- Multi-sided Simulation

- Closed form, event-driven stochastic (randomized) simulation

- Objected oriented programming (JAVA)

Model Features:

- Improved IED/EFP support as well as APS playability

- Variety of Mission Profiles

- Pre-processor GUI

- Graphical Playback

- Ground, air, naval, and amphibious operations

Army's Premier Force on Force Analysis Tool

TACOM COST & SYSTEMS ANALYSIS · *Transition Issues* · **Operational Effectiveness**

- ➢ Lack of Suitable Scenarios
  - TRAC had higher priorities than developing COMBATXXI scenarios for our customers.
  - Used customer reimbursable funding for TRAC to develop a BN+ MCO scenario.

- ➢ Database vs. flat file inputs
  - Required new skills for the team.
  - Configuration control for the databases.
  - .mdb vs. .odb – Running COMBATXXI in Linux requires .odb; yet .mdb are easier to edit.

- ➢ Upgrading equipment – Significant resources required to upgrade storage and servers.

- ➢ Crawling up the learning curve
  - Handling output – larger magnitude of output data.
  - Lack of documentation for the issues we deal with frequently.

- ➢ Issue Resolution
  - Didn't necessarily know if errors were data / model build / scenario / post processing issue.
  - Needed to develop new set of POCs to handle various issues. Mitigated by TRAC assigning a TACOM POC.

Inputs and Outputs

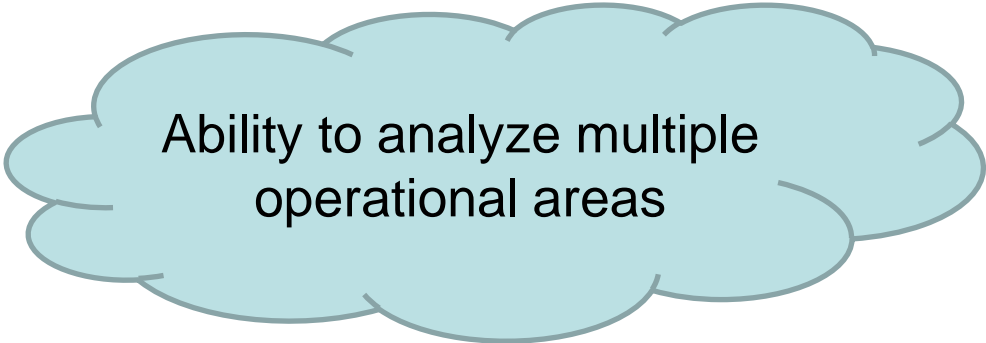TACOM COST & SYSTEMS ANALYSIS

Operational Effectiveness

- ➢ Sample COMBATXXI Inputs:
  - ▪ Probably of Hit/Kill
  - ▪ Physical Dimensions
  - ▪ Signature Management (Contrast)

  - ▪ Weapon Systems
  - ▪ Active Protection Systems
  - ▪ Sensors

- ➢ Sample COMBATXXI Outputs:
  - ▪ Killer Victim Scoreboard
  - ▪ Shots/Hits/Kills
  - ▪ Observation Logs

  - ▪ # of rounds defeated by APS
  - ▪ Survivors Remaining

- ➢ Sample Measures of Effectiveness (MoEs):

  - ▪ Lethality – Effectiveness of a weapon system against threat forces

  - ▪ Survivability – Effectiveness of a vehicle's armor system against threat munitions

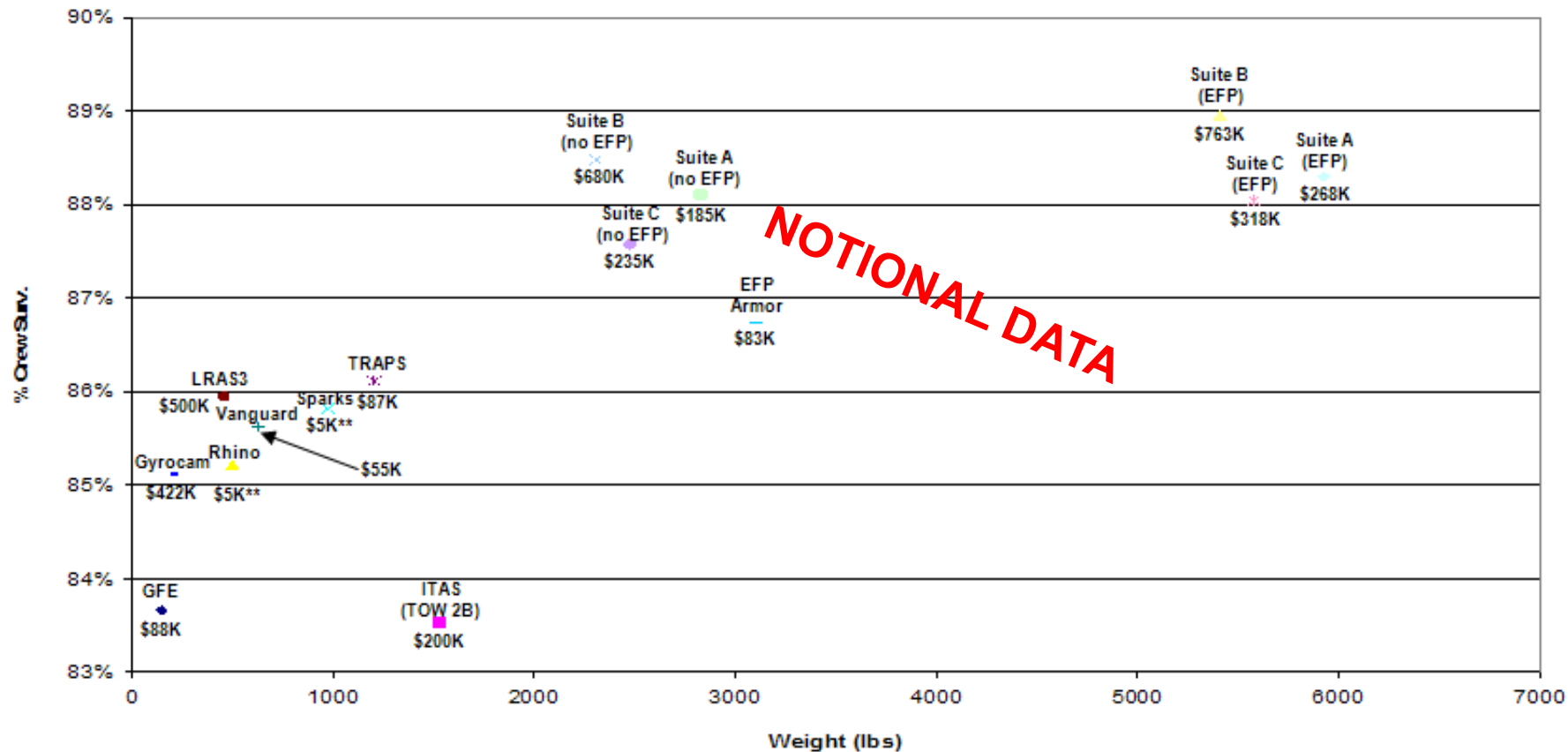 - ▪ Force Protection – Effectiveness of a vehicle's armor system to protect the soldier

Ability to analyze multiple operational areas

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RG-31A2 Trade Analysis
Cost v. Weight v. Perfomance

TACOM COST & SYSTEMS ANALYSIS **Performing Studies at TACOM** **Operational Effectiveness**

➢ Modeling emerging technologies presents unique challenges:

- Technologies need to be implemented into the model.

- Performance data often not readily available or reliable.

- TTP's may be unknown or need to be developed.

➢TACOM mitigates through:

- Working with multiple sources to obtain realistic characterization data.

- Teaming with TARDEC Soldier in the Loop (SIL) project to identify potential TTPs.

- Working with TRAC-WSMR to develop the more complex model and scenario changes needed to implement the technologies.

Recent Analysis Projects Operational Effectiveness

➤ HBCT Modernization Study:

- Study Issue: Measure the performance of various HBCT systems with different suites of technology packages with regards to survivability, lethality, and force protection.

- Utilized HBCT BN+ scenario - Southwest Asia (SWA)110.1.

- Joint effort between TRAC-WSMR and TACOM to incorporate the range of technologies into the model.

- Customers: PM Abrams, PM Bradley, PM HBCT

➤ Tactical Wheeled Vehicle Survivability (TWVS) Army Technology Objective (ATO):

- Study Issue: Follow up study to the analysis done in CASTFOREM for the TWVS ATO.

- Utilized OIF and OEF like scenarios.

- Many of the technologies modeled in CASTFOREM had not yet been implemented into COMBATXXI.

- Had to integrate performance data as well as Techniques, Tactics, and Procedures (TTPs) for certain technologies.

- Further analysis still on going.

- Customer: TARDEC

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On Going Projects

Operational Effectiveness

➢ Formation-Based Integrated Survivability for TWVS (FIST):

  ▪ Study Issue: An offshoot of TWVS ATO, the focus of this study is determining how best to integrate the technologies of interest into a vehicle formation for optimal effectiveness.

  ▪ Utilizes Northeast Asia (NEA)-Like Security Patrol & Convoy Operations Vignette.

  ▪ Involves further integration of technologies into COMBATXXI.

  ▪ Spin-off study is analyzing the effectiveness of a MRAP RPG radar.

  ▪ Customers: TARDEC and PM MRAP

➢ Robotic Armed Mobile Platform (RAMP):

  ▪ Study Issue: Implement robotic vehicles in a patrol mission role.

  ▪ Utilizes Northeast Asia (NEA)-Like Security Patrol & Convoy Operations Vignette.

  ▪ Implements new behaviors and interactions such as:

      ▪ Observing and reporting threat locations to control vehicle.

      ▪ Engaging enemy by order of control vehicle.

      ▪ Transferring control of robot to another vehicle if control vehicle is damaged.

  ▪ Customer: TARDEC

➢ Improve Support to Customer by increasing our internal capabilities to make database and scenario level changes:

- Behavior Modeling:

    - One of the largest time drivers is the creation and modification of behaviors for new and emerging technologies.

    - Team members learning Python and Behavior Scripting Language (BSL) and spent time with developers to increase our coding knowledge base.

- Database Changes:

    - Working towards increasing our ability to make small – medium level database changes without needing to rely on TRAC

    - Gaining a greater understanding of the interdependencies between tables in the database as well as any scenario changes that may be necessary

- Post Processing

    - Current post processing methods (COMBATXXI GUI and IBM's Predictive Analytics Software (PASW)) take too long to effectively deal with larger BN+ sized scenarios.

    - Evaluating utilizing a combination of current tools, as well as Python scripts and MS Excel, to increase post processing efficiency and improve our analytic capabilities.

> Increasing Internal Capabilities Reduces
> Analysis Timeline and Schedule Risk

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Questions?

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